Caregiving experiences of informal caregivers

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Positive and negative caregiving experiences: the role of the quality of the informal caregiver-care recipient relationship and intrinsic caregiving motivations

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6

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ABSTRACT

Purpose of the study: To investigate associations of the quality of the informal caregiver-care recipient relationship and intrinsic caregiving motivations with both negative and positive caregiving experiences, and the existence of buffer and thrive-effects (i.e. high relationship quality or intrinsic caregiving motivations enhance positive caregiving experiences particularly when stressors are high).

Design and Methods: 660 informal caregivers from the Lifelines informal care add-on study (Lifelines ICAS) answered questions about negative (self-rated burden scale) and positive caregiving experiences (Positive Aspects of Caregiving scale), and primary (e.g. hours of tasks of caregiving) and secondary caregiving stressors (spill-over of caregiving into other life domains (Caregiver Reaction Assessment scale)). Relationship quality was rated on a scale from 0-100. Intrinsic caregiving motivations were assessed with items like 'I did it out of love and affection'.

Results: Caregivers were on average 53 years of age (range 24-88), and 74% was female. 17% was spousal caregiver, 64% adult-child caregiver, and 19% other caregiver. Multivariate linear regression analyses showed that high relationship quality and high intrinsic caregiving motivations related to more positive caregiving experiences, while primary and especially secondary stressors were related to negative experiences. High relationship quality and high intrinsic caregiving motivations buffered for increases in negative experiences and decreases in positive caregiving experiences. Primary and secondary stressors did not relate to increases in positive experiences (no thrive-effect).

Implications: Relationship quality and intrinsic caregiving motivations play an important role for positive and negative caregiving experiences. Special attention for caregivers with low relationship quality and low intrinsic caregiving motivations is needed in policy and interventions, to prevent negative spill-over of caregiving into other life domains.

INTRODUCTION

Caregiving research has extensively studied the negative impact – like burden, stress, or depression – that informal care can have on the caregiver. Less attention is given to the positive experiences of informal caregiving, such as enjoyment, feelings of reward, love and appreciation, personal growth, or gain (1-5). Positive caregiving experiences refer to the caregiver's feeling that he or she experiences the caregiving as generally satisfying and rewarding (6), which may improve the adaptation of caregivers to difficult caregiving situations (3, 7-10). Following the lead of these studies, the present study incorporates *both* positive and negative caregiving experiences.

Caregiving is characterized by a complex interplay between characteristics of the caregiver, care recipient, and the care situation. The caregiving stress process model (11) is a widely used framework to study this complex interplay. It assumes caregiving to be a stressful experience, and distinguishes between primary stressors like intensity and types of care tasks and care recipient´s health problems, and secondary stressors, i.e. problems outside the caregiving situation that are caused by caregiving, like conflicts at work, interruptions in daily activities, family conflict, or financial problems due to caregiving. There is ample evidence that primary and secondary stressors are associated with negative caregiving outcomes such as burden or stress (7, 12, 13). Only a few studies applied this model to positive caregiving experiences (14, 15). Pinquart & Sörensen (7) conducted a meta-analysis and found that several primary stressors, such as the amount of care provision and care recipient's behavioural problems and physical and cognitive impairments, were associated with caregiver burden, but not with positive caregiving experiences (i.e. perceived uplifts of caregiving). Similar results were confirmed by other studies (14, 16, 17). For positive caregiving experiences, relational and attitudinal factors might be more important (7, 18). Therefore, besides primary and secondary stressors, this study examines the quality of the caregiver-care recipient relationship and the caregiver's level of intrinsic motivation for informal caregiving as factors that may affect how caregivers experience their caregiving (19, 20).

Caregivers of care recipients with dementia (21), Parkinson's disease (22), stroke (23), or health problems originating from frailty or old age (18, 24, 25), experienced higher stress, burden, or depression when they provided care in a poor quality relationship. Providing care in a high quality relationship appeared to be associated to less negative experiences such as burden and stress (18, 22, 24), and also to more positive caregiving experiences, like caregiving satisfaction (18, 25-28). High intrinsic caregiving motivations, i.e. motivations based on a personal desire to provide care, like providing care out of love and affection, and not because of feelings of duty or obligation (19, 29-31), are associated to higher levels of positive caregiving experiences (18, 19) and better mental health (32).

In addition to the potential direct effects of relationship quality and intrinsic caregiving motivations on both positive and negative caregiving experiences, they may also buffer negative caregiving outcomes. According to the caregiving stress process model (11), high relationship quality acts as a buffer for the negative effect of primary and secondary stressors on outcomes such as burden. Furthermore, close relationships may not only help to offset stress, but also foster an individual's ability to thrive and grow in the face of adversity (33). For informal caregivers, the existence of such a thrive-

effect would imply that high relationship quality not only buffers negative caregiving outcomes, but also enhances positive caregiving experiences, particularly when caregivers face a difficult care situation with high stressors. Stressors may then be appraised as a challenge rather than as a stressor, enhancing perceived health and personal growth (15). High intrinsic caregiving motivations may also be accompanied by the appraisal of stressors as meaningful challenges (15), and by stronger perseverance, possibly resulting in positive outcomes. Moreover, being able to manage a difficult care situation brings personal accomplishment and status (34).

This study has two main objectives. In order to gain more insights in the role of relationship quality and intrinsic caregiving motivations for both negative and positive caregiving experiences, it investigates to what extent relationship quality and intrinsic caregiving motivations (1) are related to negative and positive caregiving experiences, independent from primary and secondary stressors, and (2) moderate the associations of primary and secondary stressors with negative and positive caregiving experiences (i.e. buffer or thrive-effect).

DESIGN AND METHODS

The Lifelines Cohort Study

The Lifelines Cohort Study is a large multi-disciplinary prospective population-based cohort study examining in a unique three-generation design the health and health-related behaviours of 167.729 persons living in the North of the Netherlands (35, 36). It employs a broad range of investigative procedures in assessing the biomedical, socio-demographic, behavioural, physical and psychological factors which contribute to the health and disease of the general population, with a special focus on multimorbidity and complex genetics. A detailed cohort profile of Lifelines has been described elsewhere (36). The Lifelines Cohort Study is approved by the medical ethical committee of the University Medical Center Groningen, the Netherlands. All participants signed an informed consent form. Lifelines is a facility that is open for all researchers. Information on the application and data access procedure is summarized on www.lifelines.net.

Lifelines Informal Care Add-on study (Lifelines ICAS)

Informal caregivers were identified in the second Lifelines follow-up questionnaire, which was distributed among all Lifelines participants aged 18 years and older, about five years after baseline. Informal care was defined as: "Unpaid care which is provided to a loved one, for example your partner, a family member, friend, or other relative, because of chronic disabilities and/or health problems. Voluntary work and care for healthy children is not included". Identified informal caregivers were asked for consent to participate in Lifelines ICAS, a comprehensive informal care questionnaire. Subsequently, the informal care questionnaire was sent by post (paper questionnaire) or by email (digital questionnaire), depending on participant's preference. Detailed information about the study design and data collection and the

non-response in Lifelines ICAS is described elsewhere (37, 38). Parental caregivers (caring for a child (in-law)) and informal caregivers caring for someone living in a care institution (home for the aged, nursing home) were excluded from the analyses, because caring for a child (in-law) differs from caring for a spouse, parent (in-law), or brother/sister, friend, or neighbour (39), and informal caregiving for someone living in a care institution differs from informal caregiving for a community-dwelling person (40).

Measurements

Positive and negative caregiving experiences

Positive caregiving experiences were measured with the Positive Aspects of Caregiving Scale (PAC), consisting of 2 components: self-affirmation (6 items, e.g. 'providing help to care recipient has made me feel more useful'), and outlook on life (3 items, e.g. 'providing help to care recipient enabled me to appreciate life more') (6). Caregivers rated on a 5-point agree/disagree scale (1=disagree a lot; 5=agree a lot) to what extent they agreed with the statements. All items were summed up into one summary scale of positive caregiving experiences (range 9-45), with a higher score indicating more positive experiences. The PAC scale has shown adequate reliability and validity (6). Cronbach's alpha of the 9 item summary score was .89 (component self-affirmation .87, component outlook on life .84, bivariate correlation .63).

Negative caregiving experiences were defined as overall caregiver burden experienced by caregivers. Caregivers were asked how difficult the caregiving is for them, on a scale from 0 (not difficult at all/minimal burden) to 100 (far too difficult/severe burden). This single question is based on the self-rated burden scale (SRB). The SRB has shown good psychometric properties in a wide range of caregivers (41, 42).

Primary stressors

Primary stressors included (a) the number of different care tasks that were performed (i.e. household care, personal care, nursing care, emotional support and supervision, administrative help, help with transport), (b) the total hours of informal caregiving a week, (c) the duration of caregiving (years), and (d) the health problems of the care recipient, consisting of whether the care recipient had (starting) dementia or cognitive problems (0=no, 1=yes), and whether the care recipient had behavioural problems (0=no, 1=yes).

Secondary stressors

Secondary stressors were measured with the Caregiver Reaction Assessment scale (CRA) (43). The CRA is a validated and reliable instrument to measure the reactions of caregivers to their caregiving situation (43, 44). It includes 24 items and 5 dimensions, of which 3 dimensions were used in this study: (1) 'disrupted schedule', measuring how caregiving affected a caregiver's daily schedule (5 items, e.g. 'I have to stop in the middle of my work or activities to provide care'), (2) 'financial problems', which

measures the impact of caregiving on the caregiver's financial situation (3 items, e.g. 'Caring for my care recipient puts a financial strain on me'), and (3) 'health problems', measuring the impact of caregiving on caregiver's health (4 items, e.g. 'It takes all my physical strength to care for my care recipient'). Caregivers rated the perceived impact of caregiving on a 5-point Likert scale, ranging from strongly agree (1) to strongly disagree (5). Average scores were calculated for each dimension, with higher scores indicating a higher negative impact. Cronbach's alphas were .84, .75, and .77, for disrupted schedule, financial problems, and health problems, respectively.

Moderators

For relationship quality, caregivers were asked to rate the quality of their relationship with their care recipient on a scale from 0 (worst relationship possible) to 100 (best relationship possible). This allows caregivers to base their judgement about the quality of the relationship on the aspects of the relationship that are most important to them (based on (45, 46), in (47)).

The level of the caregiver's intrinsic motivation to provide informal care was measured with four items that relate to this intrinsic motivation (e.g.' I did it out of love and affection', 'My loved one would, if it would happen to me, care for me as well'). For each item, the caregiver indicated whether this played no role (0), a small role (1), or a strong role (2). A mean score was calculated (range 0-2), with Cronbach's alpha .67.

Background/contextual characteristics

Caregiver's age (years), gender (0=male, 1=female), educational level (primary, secondary, tertiary), and paid work (0=no, 1=yes) were included. Care situation characteristics were the type of care relationship, with the categories adult-child caregivers (caring for their parent (in-law)), spousal caregivers (caring for their spouse), and other caregivers (caring for someone else, like a brother/sister, friend, neighbour). In addition, we included whether there was informal or formal support available (0=no, 1=yes), and whether caregiver and care recipient were living together (0=no, 1=yes).

Statistical analysis

First, study population characteristics were described for the total group of caregivers and stratified by type of care relationship. Second, linear regression analyses were conducted, separately for the outcomes negative and positive caregiving experiences. The independent variables were entered in hierarchical steps: background/contextual variables (model 1), primary stressors (model 2), secondary stressors (model 3), negative/positive caregiving experiences (model 4), and moderators (relationship quality, intrinsic caregiving motivation) (model 5). Multicollinearity diagnostics were evaluated to check for multicollinearity. If multicollinearity was evident (condition index >10.0 and variance proportions > .50), collinear variables were entered into separate regression models, and results are presented separately. Third, for each primary and secondary stressor that was related ($p < .05$) to negative or positive caregiving experiences (model 5), we tested whether this relationship was moderated by relationship quality or intrinsic caregiving motivations. This moderation was tested in a model consisting

of the primary or secondary stressor (centred), relationship quality or intrinsic caregiving motivations (centred), and the interaction term. Simple slope analysis was conducted to test at which values of the moderator (minimum/maximum, -1 and +1 standard deviation) the gradient of the slope differed ($p < .05$) from zero (48). Fourth, subgroup analyses were conducted for the different types of care relationships in the study population (i.e. spousal caregivers, adult-child caregivers, other caregivers). IBM SPSS Statistics 22 was used for all statistical analyses.

RESULTS

Study population characteristics

In total, 965 informal caregivers participated in Lifelines ICAS. After exclusion of parental caregivers (N=131, 14%), caregivers caring for someone living in a care institution (N=118, 12%), and caregivers with missing values on one or more variables (N=56, 6%; percentages of missing values ranged from 0% to 2% on separate variables), 660 caregivers (68%) were included in the analysis.

Table 1 presents the characteristics of the study population, stratified by type of care relationship. The majority (64%) was adult-child caregiver, 17% cared for their spouse, and 19% cared for someone else, like another family member, friend, or neighbour, but not their child. Spousal caregivers were older and less often female compared to adult-child and other caregivers. In addition, spousal caregivers were lower educated, had less often paid work, were more often living together with their care recipient, received less often informal or formal support, provided more informal care (more different care tasks and hours of caregiving a week), cared less often for a care recipient with dementia, experienced a more disrupted schedule, more financial problems, and more health problems due to their caregiving, had higher intrinsic caregiving motivations, and experienced a higher burden, compared to adult-child and other caregivers. Other caregivers cared for a care recipient with behavioural problems more often, and had more positive caregiving experiences, compared to spousal and adult-child caregivers.

Negative caregiving experiences (self-rated burden)

Table 2 presents the results of the linear regression analyses investigating the associations of primary and secondary stressors, relationship quality, and intrinsic caregiving motivations with self-rated burden. Primary stressors were related to higher self-rated burden. Caregivers who provided a greater variety of care tasks (model 2: b 4.77, 95% CI 3.06 to 4.48), more hours of informal care a week (model 2: b .25, 95% CI .10 to .39), or who cared for someone with behavioural problems (model 2: b 12.03, 95% CI 5.38 to 18.69), experienced a higher burden. However, after inclusion of the secondary stressors (model 3-5), only the association between caring for someone with behavioural problems and self-rated burden remained (model 3: b 7.00, 95% CI 1.46 to 12.54). Considering the secondary stressors, results show that caregivers experienced a higher burden when they experienced a more disrupted schedule due to caregiving (model 3: b 14.78, 95% CI 12.08 to 12.48), or experienced more health problems

Table 1: Study population characteristics total sample (N=660) and stratified by type of care relationship

	Total study population	Spousal caregivers	Adult-child caregivers	Other caregivers	p-value [a]
Type of care relationship (N, %)		115 (17%)	423 (64%)	122 (19%)	
Background/contextual variables					
Caregiver age in years (24-88) (mean, SD)	52.7 (10.0)	58.5 (12.6)	51.4 (7.8)	51.8 (11.8)	.000
Caregiver gender (N, % female)	487 (74%)	54 (47%)	331 (78%)	102 (84%)	.000
Caregiver educational level					.000
N, % primary	195 (30%)	56 (49%)	105 (25%)	34 (28%)	
N, % secondary	254 (38%)	30 (26%)	174 (41%)	50 (41%)	
N, % tertiary	211 (32%)	29 (25%)	144 (34%)	38 (31%)	
Caregiver paid work (N, % yes)	456 (69%)	57 (50%)	320 (76%)	43 (65%)	.000
Living together (N, % yes)	145 (22%)	109 (95%)	30 (7%)	6 (5%)	.000
Informal support available (N, % yes)	273 (41%)	19 (17%)	196 (46%)	58 (48%)	.000
Formal support available (N, % yes)	407 (62%)	35 (30%)	293 (69%)	79 (65%)	.000
Primary stressors					
Number of caregiving tasks (1-6) (mean, SD)	3.2 (1.2)	3.9 (1.4)	3.3 (1.1)	2.6 (1.1)	.000
Total hours of caregiving a week (1-150) (median, IQ range)	4.0 (3.0-10.0)	14.0 (7.0-22.0)	4.0 (2.0-7.0)	4.0 (2.0-5.0)	.000
Duration of caregiving in years (0-46) (median, IQ range)	4.0 (1.0-8.0)	5.0 (2.0-13.0)	4.0 (1.0-8.0)	4.0 (1.0-8.0)	.172
Care recipient dementia (N, % yes)	195 (30%)	19 (17%)	149 (35%)	27 (22%)	.000
Care recipient behavioural problems (N, % yes)	64 (10%)	13 (11%)	27 (6%)	24 (20%)	.000
Secondary stressors					
CRA disrupted schedule (1.0-5.0) (mean, SD)	2.5 (.8)	3.2 (.8)	2.4 (.8)	2.1 (.7)	.000
CRA financial problems (1.0-5.0) (mean, SD)	2.3 (.7)	2.8 (.9)	2.1 (.6)	2.2 (.7)	.000
CRA health problems (1.0-5.0) (mean, SD)	2.1 (.7)	2.5 (.8)	2.0 (.6)	1.8 (.6)	.000
Moderators					
Relationship quality (0-100) (median, IQ range)	80.0 (70.0-90.0)	80.0 (70.0-95.0)	80.0 (70.0-90.0)	80.0 (70.0-90.0)	.403
Intrinsic caregiving motivation (0-2) (mean, SD)	1.3 (.5)	1.5 (.5)	1.3 (.5)	1.2 (.5)	.000
Caregiving experiences					
Self-rated burden (0-100) (mean, SD)	35.9 (26.4)	42.3 (28.4)	34.8 (25.5)	33.4 (26.9)	.014
Positive experiences (PAC) (9-45) (mean, SD)	28.4 (5.6)	28.9 (5.6)	27.9 (5.6)	29.7 (5.6)	.005

[a] Tests for differences between types of care relationships are based on Chi-square test (categorical variables), ANOVA (normally distributed continuous variables), and Kruskal-Wallis tests (not normally distributed continuous variables)

due to caregiving (model 3: b 20.94, 95% CI 18.25 to 23.63). These associations remained after inclusion of positive caregiving experiences (model 4) and moderators (model 5). Positive caregiving experiences were negatively related to self-rated burden (model 4: b -.56, 95% CI -.85 to -.28). Relationship quality and intrinsic caregiving motivations were not related to subjective burden (model 5). With regard to the type of care relationship, results show that when controlled for primary and secondary stressors (model 3-5), other caregivers experienced higher burden compared to spousal and adult-child caregivers. The presence of formal support was associated with higher self-rated burden (model 3-5).

Positive caregiving experiences

Table 3 presents the results of the linear regression analyses investigating the associations of primary and secondary stressors, relationship quality, and intrinsic caregiving motivations with positive caregiving experiences. Of all primary stressors, only caregiving duration was related to positive caregiving experiences: when caregivers provided informal care for a longer period, they experienced their caregiving as less positive (model 2: b -.08, 95% CI -.15 to -.02). This association remained the same in all models. Considering the secondary stressors, only health problems due to caregiving were related to positive caregiving experiences: when caregivers experienced more health problems, they experienced their caregiving as less positive (model 3: b -.86, 95% CI -1.57 to -.15). However, this association was not present anymore ($p < .05$) after inclusion of self-rated burden (model 4) and the moderators (model 5). Self-rated burden was negatively related to positive caregiving experiences (model 4: b -.04, 95% CI -.06 to -.02). Relationship quality and intrinsic caregiving motivations affected positive caregiving experiences. A higher relationship quality (model 5: b .06, 95% CI .04 to .08) and a higher intrinsic caregiving motivation (model 5: b 2.04, 95% CI 1.17 to 2.90) were both related to more positive caregiving experiences. With regard to the type of care relationship, results show that other caregivers experienced more positive caregiving experiences than adult-child caregivers (see note in Table 3).

Table 2: Multivariable linear regression analysis with outcome self-rated burden (0-100) (N=660)

	Model 1			Model 2			Model 3		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**
Constant	34.28***	(8.48)	(17.64 to 50.93)	11.28	(8.57)	(-5.55 to 28.11)	-33.70***	(8.12)	(-49.65 to -17.75)
Background/contextual variables [a]									
Caregiver age (24-88)	.07	(.12)	(-.17 to .31)	.01	(.12)	(-.22 to .24)	-.05	(.10)	(-.24 to .15)
Caregiver gender (female = 1)	1.23	(2.46)	(-3.60 to 6.06)	-.00	(2.35)	(-4.61 to 4.60)	-.24	(1.97)	(-4.10 to 3.63)
Caregiver educational level (ref. primary)									
- secondary	-.55	(2.63)	(-5.70 to 4.61)	-.92	(2.49)	(-5.81 to 3.97)	.55	(2.07)	(-3.52 to 4.61)
- tertiary	-.32	(2.73)	(-5.68 to 5.5)	-.56	(2.60)	(-5.66 to 4.55)	1.94	(2.20)	(-2.38 to 6.26)
Caregiver paid work (0, 1)	5.10	(2.60)	(-.01 to 10.21)	5.97*	(2.49)	(1.08 to 10.86)	3.15	(2.08)	(-.92 to 7.23)
Type of care relationship (ref. spousal) [b]									
- adult-child caregiver	-9.73**	(3.20)	(-16.01 to -3.45)	-2.94	(3.18)	(-9.19 to 3.32)	5.04	(2.72)	(-.31 to 10.39)
- other caregiver	-10.60**	(3.77)	(-18.01 to -3.19)	-1.66	(3.83)	(-9.18 to 5.86)	9.15**	(3.25)	(2.78 to 15.53)
Informal support available (0, 1)	-3.9	(2.16)	(-4.64 to 3.86)	.94	(2.06)	(-3.10 to 4.98)	.56	(1.71)	(-2.78 to 3.91)
Formal support available (0, 1)	3.28	(2.25)	(-1.15 to 7.70)	1.70	(2.16)	(-2.53 to 5.94)	4.59*	(1.80)	(1.07 to 8.12)
Primary stressors									
Number of caregiving tasks (1-6)				4.77***	(.87)	(3.06 to 4.48)	1.22	(.77)	(-.29 to 2.73)
Total hours of caregiving a week (1-168)				.25**	(.07)	(.10 to .39)	.03	(.06)	(-.10 to .15)
Duration of caregiving in years (0-46)				.21	(.15)	(-.07 to .51)	.12	(.13)	(-.13 to .37)
Care recipient dementia (0, 1)				3.44	(2.24)	(-.96 to 7.83)	2.95	(1.86)	(-.70 to 6.60)
Care recipient behavioural problems (0, 1)				12.03***	(3.39)	(5.38 to 18.69)	7.00*	(2.82)	(1.46 to 12.54)
Secondary stressors									
CRA disrupted schedule (1-5) [c]							14.78***	(1.38)	(12.08 to 12.48)
CRA financial problems (1-5)							1.63	(1.32)	(-.96 to 4.22)
CRA health problems (1-5) [c]							20.94***	(1.37)	(18.25 to 23.63)
Caregiving experiences									
Positive experiences (9-45)									
Moderators									
Relationship quality (0-100)									
Intrinsic caregiving motivation (0-2)									
Explained variance (R^2)	.023			.139			.412		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses because of multicollinearity with type of care relationship

[b] In models 1-3 no statistically significant difference between adult-child and other caregivers. In model 4 and 5 other caregivers significantly higher self-rated burden compared to adult-child caregivers (model 4: b 5.09, se 2.23, 95%CI .71 to 9.45, p-value .023; model 5: b 4.50, se 2.23, 95%CI .12 to 8.88).

[c] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table 2 continued: Multivariable linear regression analysis with outcome self-rated burden (0-100) (N=660)

	Model 4			Model 5		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**
Constant	-12.93	(9.68)	(-31.94 to 6.07)	-4.85	(10.18)	(-24.85 to 15.14)
Background/contextual variables [a]						
Caregiver age (24-88)	-.08	(.10)	(-.27 to .11)	-.10	(.10)	(-.29 to .09)
Caregiver gender (female = 1)	-.74	(1.95)	(-4.58 to 3.09)	-.92	(1.94)	(-4.74 to 2.89)
Caregiver educational level (ref. primary)						
- secondary	.29	(2.05)	(-3.73 to 4.31)	-.02	(2.04)	(-4.03 to 3.99)
- tertiary	1.41	(2.18)	(-2.87 to 5.69)	1.02	(2.18)	(-3.25 to 5.29)
Caregiver paid work (0, 1)	2.74	(2.06)	(-1.30 to 6.77)	2.95	(2.10)	(-1.07 to 6.98)
Type of care relationship (ref. spousal) [b]						
- adult-child caregiver	4.51	(2.70)	(-.79 to 9.81)	4.18	(2.71)	(-1.14 to 9.50)
- other caregiver	9.60**	(3.21)	(3.28 to 15.91)	8.68**	(3.23)	(2.33 to 15.02)
Informal support available (0, 1)	.62	(1.69)	(-2.0 to 3.93)	.75	(1.68)	(-2.55 to 4.05)
Formal support available (0, 1)	4.27*	(1.78)	(.78 to 7.77)	4.01*	(1.77)	(.52 to 7.48)
Primary stressors						
Number of caregiving tasks (1-6)	1.24	(.76)	(-.26 to 2.73)	1.35	(.76)	(-.15 to 2.84)
Total hours of caregiving a week (1-168)	.04	(.06)	(-.09 to .16)	.05	(.06)	(-.07 to .18)
Duration of caregiving in years (0-46)	.08	(.13)	(-.17 to .32)	.10	(.13)	(-.14 to .35)
Care recipient dementia (0, 1)	2.70	(1.84)	(-.91 to 6.32)	2.55	(1.83)	(-1.05 to 6.15)
Care recipient behavioural problems (0, 1)	6.82*	(2.79)	(1.33 to 12.31)	4.89	(2.90)	(-.80 to 10.57)
Secondary stressors						
CRA disrupted schedule (1-5) [c]	14.75***	(1.36)	(12.09 to 17.41)	14.36***	(1.35)	(11.71 to 17.02)
CRA financial problems (1-5)	1.28	(1.31)	(-1.29 to 3.85)	1.05	(1.31)	(-1.52 to 3.63)
CRA health problems (1-5) [c]	20.49***	(1.36)	(17.81 to 23.17)	16.29***	(1.63)	(13.10 to 19.49)
Caregiving experiences						
Positive experiences (9-45)	-.56***	(.15)	(-.85 to -.28)	-.42**	(.15)	(-.72 to -.12)
Moderators						
Relationship quality (0-100)				-.06	(.05)	(-.16 to .03)
Intrinsic caregiving motivation (0-2)				3.29	(1.75)	(-6.72 to .14)
Explained variance (R^2)	.425			.432		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses because of multicollinearity with type of care relationship

[b] In models 1-3 no statistically significant difference between adult-child and other caregivers. In model 4 and 5 other caregivers significantly higher self-rated burden compared to adult-child caregivers (model 4: b 5.09, se 2.23, 95%CI .71 to 9.45, p-value .023; model 5: b 4.50, se 2.23, 95%CI .12 to 8.88).

[c] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table 3: Multivariable linear regression analysis with outcome positive caregiving experiences (9-45) (N=660)

	Model 1			Model 2			Model 3		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**
Constant	33.81***	(1.79)	(30.31 to 37.32)	34.12	(1.91)	(30.37 to 37.88)	36.93***	(2.17)	(32.67 to 41.19)
Background/contextual variables [a]									
Caregiver age (24-88)	-.06*	(.03)	(-.11 to -.01)	-.06*	(.03)	(-.11 to -.01)	-.06*	(.03)	(-.11 to -.01)
Caregiver gender (female = 1)	-.92	(.52)	(-1.93 to .10)	-.93	(.52)	(-1.96 to .10)	-.91	(.53)	(-1.94 to .13)
Caregiver educational level (ref. primary)									
- secondary	-.36	(.55)	(-1.45 to .73)	-.31	(.56)	(-1.40 to .78)	-.45	(.55)	(-1.54 to .64)
- tertiary	-.56	(.58)	(-1.69 to .58)	-.60	(.58)	(-1.74 to .54)	-.95	(.59)	(-2.10 to .21)
Caregiver paid work (0, 1)	-.89	(.55)	(-1.96 to .19)	-.79	(.56)	(-1.88 to .30)	-.75	(.56)	(-1.84 to .35)
Type of care relationship (ref. spousal) [b]									
- adult-child caregiver	-.60	(.67)	(-1.92 to .73)	-.57	(.71)	(-1.97 to .82)	-.95	(.73)	(-2.38 to .48)
- other caregiver	1.12	(.80)	(-.44 to 2.68)	1.23	(.85)	(-.45 to 2.90)	.78	(.87)	(-.92 to 2.49)
Informal support available (0, 1)	.05	(.46)	(-.84 to .95)	.10	(.46)	(-.80 to 1.00)	.09	(.46)	(-.81 to .98)
Formal support available (0, 1)	-.49	(.48)	(-1.42 to .44)	-.42	(.48)	(-1.36 to .53)	-.57	(.48)	(-1.51 to .38)
Primary stressors									
Number of caregiving tasks (1-6)				-.04	(.19)	(-.42 to .34)	.03	(.21)	(-.37 to .43)
Total hours of caregiving a week (1-168)				.01	(.02)	(-.02 to .05)	.02	(.02)	(-.02 to .05)
Duration of caregiving in years (0-46)				-.08*	(.03)	(-.15 to -.02)	-.07*	(.03)	(-.14 to -.01)
Care recipient dementia (0, 1)				-.38	(.50)	(-1.36 to .60)	-.44	(.50)	(-1.42 to .53)
Care recipient behavioural problems (0, 1)				-.54	(.76)	(-2.03 to .94)	-.322	(.76)	(-1.81 to 1.16)
Secondary stressors									
CRA disrupted schedule (1-5) [c]							-.04	(.34)	(-.71 to .63)
CRA financial problems (1-5)							-.62	(.35)	(-1.32 to .07)
CRA health problems (1-5) [c]							-.86*	(.36)	(-1.57 to -.15)
Caregiving experiences									
Self-rated burden (0-100)									
Moderators									
Relationship quality (0-100)									
Intrinsic caregiving motivation (0-2)									
Explained variance (R^2)	.033			.044			.063		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses because of multicollinearity with type of care relationship

[b] In models 1-5 other caregivers significantly higher positive caregiving experiences compared to adult-child caregivers (model 1: b 1.71, se .57, 95%CI .58 to 2.83, p-value .003; model 2: b 1.80, se .60, 95%CI .62 to 2.97, p-value .003; model 3: b 1.73, se .60, 95%CI .56 to 2.91, p-value .004; model 4: b 1.90, se .59, 95%CI .73 to 3.06, p-value .001; model 5: b 2.09, se .57, 95%CI .98 to 3.20, p-value .000).

[c] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear

Table 3 continued: Multivariable linear regression analysis with outcome positive caregiving experiences (9-45) (N=660)

	Model 4			Model 5		
	b	**(se)**	**(95% CI**	**b**	**(se)**	**(95% CI**
Constant	35.57***	(2.18)	(31.30 to 39.85)	25.76***	(2.39)	(21.07 to 30.46)
Background/contextual variables [a]						
Caregiver age (24-88)	-.06*	(.03)	(-.11 to -.01)	-.04	(.03)	(-.09 to .01)
Caregiver gender (female = 1)	-.92	(.52)	(-1.94 to .11)	-.69	(.50)	(-1.66 to .29)
Caregiver educational level (ref. primary)						
- secondary	-.43	(.55)	(-1.50 to .65)	-.17	(.52)	(-1.20 to .85)
- tertiary	-.87	(.58)	(-2.01 to .27)	-.50	(.56)	(-1.59 to .59)
Caregiver paid work (0, 1)	-.62	(.55)	(-1.70 to .46)	-.72	(.52)	(-1.75 to .31)
Type of care relationship (ref. spousal) [b]						
- adult-child caregiver	-.75	(.72)	(-2.16 to .67)	-.56	(.69)	(-1.92 to .80)
- other caregiver	1.15	(.86)	(-.54 to 2.85)	1.53	(.83)	(-.09 to 3.16)
Informal support available (0, 1)	.11	(.45)	(-.77 to 1.00)	-.00	(.43)	(-.84 to .84)
Formal support available (0, 1)	-.38	(.48)	(-1.32 to .56)	-.18	(.45)	(-1.07 to .71)
Primary stressors						
Number of caregiving tasks (1-6)	.08	(.20)	(-.32 to .48)	-.01	(.19)	(-.39 to .38)
Total hours of caregiving a week (1-168)	.02	(.02)	(-.01 to .05)	.00	(.02)	(-.03 to .03)
Duration of caregiving in years (0-46)	-.07*	(.03)	(-.14 to -.00)	-.08*	(.03)	(-.15 to -.02)
Care recipient dementia (0, 1)	-.32	(.49)	(-1.29 to .64)	-.19	(.47)	(-1.11 to .73)
Care recipient behavioural problems (0, 1)	-.04	(.75)	(-1.51 to 1.43)	1.44	(.74)	(-.02 to 2.88)
Secondary stressors						
CRA disrupted schedule (1-5) [c]	.62	(.36)	(-.10 to 1.33)	.54	(.35)	(-.14 to 1.22)
CRA financial problems (1-5)	-.56	(.35)	(-1.24 to .13)	-.38	(.33)	(-1.03 to .28)
CRA health problems (1-5) [c]	-.08	(.42)	(-.91 to .74)	.18	(.40)	(-.61 to .97)
Caregiving experiences						
Self-rated burden (0-100)	-.04***	(.01)	(-.06 to -.02)	-.03**	(.01)	(-.05 to -.01)
Moderators						
Relationship quality (0-100)				.06***	(.01)	(.04 to .08)
Intrinsic caregiving motivation (0-2)				2.04***	(.44)	(1.17 to 2.90)
Explained variance (R^2)	.084			.176		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses because of multicollinearity with type of care relationship

[b] In models 1-5 other caregivers significantly higher positive caregiving experiences compared to adult-child caregivers (model 1: b 1.71, se .57, 95%CI .58 to 2.83, p-value .003; model 2: b 1.80, se .60, 95%CI .62 to 2.97, p-value .003; model 3: b 1.73, se .60, 95%CI .56 to 2.91, p-value .004; model 4: b 1.90, se .59, 95%CI .73 to 3.06, p-value .001; model 5: b 2.09, se .57, 95%CI .98 to 3.20, p-value .000).

[c] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear

Moderation by relationship quality and intrinsic caregiving motivations

On the basis of the associations in the linear regression analyses that were statistically significant ($p < .05$) (model 5 in Table 2 and Table 3), we tested whether relationship quality and intrinsic caregiving motivations moderated the associations between (1) disrupted schedule due to caregiving and self-rated burden, (2) health problems due to caregiving and self-rated burden, and (3) duration of caregiving and positive caregiving experiences. Results show that the associations between disrupted schedule and self-rated burden (Table 4A), and between health problems and self-rated burden (Table 4B), were not moderated by relationship quality or intrinsic caregiving motivations. The negative association between duration of caregiving and positive caregiving experiences was moderated by intrinsic caregiving motivations (Table 4C, interaction term: b .16, 95% CI .03 to .29). Caregivers with low intrinsic caregiving motivations experienced their caregiving as less positive when they were providing informal care for a longer period. For caregivers with high intrinsic caregiving motivations, this association between caregiving duration and positive caregiving experiences was not present (Figure 1). However, simple slope analysis demonstrated that the gradient of the slope of caregiving duration was not statistically significant ($p < .05$) at the mean value (b -.09, p .635), -1 standard deviation (b -.17, p .445), and +1 standard deviation (b .00, p .994) of intrinsic caregiving motivations (not shown in Table).

Adult-child caregivers

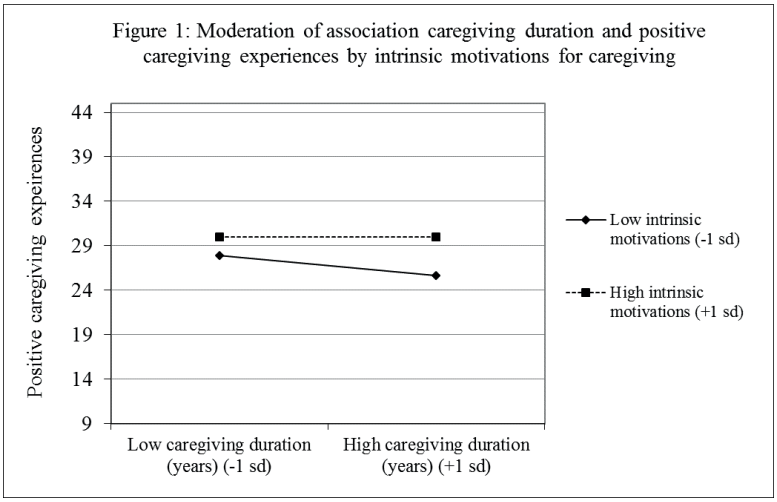
We conducted subgroup analyses for the groups of spousal caregivers (N=115), adult-child caregivers (N=423), and other caregivers (N=122). For adult-child caregivers we conducted the same statistical analyses as for the total study population (multivariable linear regression analyses and tests of moderation by relationship quality and intrinsic caregiving motivations) (see Additional file, Tables S1-S3). The results of these analyses were largely comparable to the results in the total study population. However, a few differences emerged. First, caring for a person with behavioural problems was not related to self-rated burden, while in the total study population this was related to a higher self-rated burden (model 2-4). Second, adult-child caregivers who provided a higher number of caregiving tasks experienced a higher self-rated burden, which was not found in the total study population. Third, for adult-child caregivers, their relationship quality moderated the associations of a disrupted schedule and health problems due to caregiving with higher self-rated burden, which was not found in the total study population. When relationship quality was higher, the positive association between disrupted schedule and self-rated health, and the positive association between health problems and self-rated burden, was stronger (see Additional file, Figure S1, S2). And fourth, intrinsic caregiving motivations did not moderate the negative association between duration of caregiving and positive caregiving experiences among adult-child caregivers, while this moderation was found in the total study population.

Table 4: Moderation by relationship quality and intrinsic caregiving motivations (N=660) [a]

4A: Outcome = self-rated burden (0-100); stressor = disrupted schedule			
	b	**(se)**	**(95% CI)**
Constant	35.91***	(.87)	(34.19 to 37.62)
Disrupted schedule (centred)	15.34***	(1.05)	(13.29 to 17.42)
Relationship quality (centred)	-.26***	(.05)	(-.35 to -.17)
Interaction	.02	(.05)	(-.08 to .12)
Constant	35.90***	(.87)	(34.18 to 7.62)
Disrupted schedule (centred)	16.74***	(1.05)	(14.98 to 18.80)
Intrinsic caregiving motivations (centred)	-7.92***	(1.66)	(-11.18 to -4.67)
Interaction	-1.06	(1.95)	(-4.90 to 2.77)
4B: Outcome = self-rated burden (0-100); stressor = health problems			
	b	**(se)**	**(95% CI)**
Constant	36.13***	(.84)	(34.48 to 37.79)
Health problems (centred)	21.41***	(1.23)	(18.99 to 23.83)
Relationship quality (centred)	-.18***	(.04)	(-.27 to -.10)
Interaction	.09	(.05)	(-.02 to .19)
Constant	35.86***	(.83)	(34.23 to 37.48)
Health problems (centred)	22.32***	(1.19)	(1.99 to 24.66)
Intrinsic caregiving motivations (centred)	-5.4**	(1.57)	(-8.50 to -2.34)
Interaction	1.13	(2.17)	(-3.14 to 5.39)
4C: Outcome = positive caregiving experiences (9-45); stressor = duration of caregiving			
	b	**(se)**	**(95% CI)**
Constant	28.43***	(.21)	(28.02 to 28.84)
Duration of caregiving in years (centred)	-.07*	(.03)	(-.13 to -.01)
Relationship quality (centred)	.08***	(.01)	(.06 to .11)
Interaction	-.00	(.00)	(-.01 to .00)
Constant	28.41***	(.21)	(28.00 to 28.82)
Duration of caregiving in years (centred)	-.09**	(.03)	(-.15 to -.02)
Intrinsic caregiving motivations (centred)	3.04***	(.39)	(2.26 to 3.81)
Interaction	.16*	(.07)	(.03 to .29)

* p<.05; ** p<.01; *** p <.001

[a] Stressors and moderators are centred variables



Spousal caregivers and other caregivers

Due to small sample sizes, we were not able to conduct multivariable linear regression analyses, but could only conduct univariable linear regression analyses for the subgroups of spousal caregivers (N=115) and other caregivers (N=122) (see Additional file, Tables S4-S5). Therefore, results should be interpreted with caution, and a comparison with the total study population and the subgroup of adult-child caregivers is difficult to make. However, in general, the results seemed to be in line with the results in the total study population and in the subgroup for adult-child caregivers. For self-rated burden, primary stressors and particularly secondary stressors seemed to be important. For positive caregiving experiences, relationship quality and intrinsic caregiving motivations turned out to be most important.

DISCUSSION

This study investigated the role of relationship quality and intrinsic caregiving motivations for both negative and positive caregiving experiences, independently from primary and secondary caregiving stressors. In addition, the potential buffer- and thrive-effects of relationship quality and intrinsic caregiving motivations were explored. From this study, we can draw three main conclusions. First, caregiving in a high quality relationship and with high intrinsic caregiving motivations was primarily related to positive caregiving experiences. Second, the impact of caregiving in other life domains such as work, social activities, and health (i.e. secondary stressors) were most important for negative caregiving experiences. And third, intrinsic caregiving motivations provided a buffer for decreases in positive caregiving experiences, but an actual thrive-effect was not found.

Relationship quality and intrinsic caregiving motivations important for positive caregiving experiences

Informal caregivers with high intrinsic caregiving motivations who provided care in a high quality relationship had more positive caregiving experiences. The low explained variance of positive caregiving experiences (17.6% compared to 43.2% for negative experiences) suggests that other factors may determine positive caregiving experiences as well. For example, religious caregivers experience their caregiving as more positive (49, 50), but positive caregiving experiences are also reported by caregivers who use specific caregiving strategies (like problem-focused coping (51), active management (52), and encouragement (17)), or who participate in caregiver educational and support group programmes (52). Future research might benefit from addressing the wide range of factors that could not be measured in this study, but may contribute to positive caregiving experiences. The primary and secondary caregiving stressors did not affect positive caregiving experiences, except for the duration of caregiving, which reduced positive caregiving experiences. This corresponds with the idea of caregiving being a chronic stressor with caregiving demands impairing the resources and well-being of caregivers as the informal care continues and persists, also referred to as the wear-and-tear hypothesis (53, 54).

Impact of caregiving in other life domains important for negative caregiving experiences

The stress process model poses that both primary and secondary stressors affect negative caregiving outcomes (11). This study demonstrates that it may be not so much the primary stressors, but rather the impact of caregiving in other life domains such as work, social activities, and health that is important for negative outcomes such as caregiver burden. An explanation could be that the impact of the actual care load (primary stressors) on caregiver burden was mediated by the secondary stressors, since stressors within the caregiving situation affect other roles and activities outside the caregiving situation (11). The spill-over effects of caregiving into other life domains should therefore be a major source of concern for policy makers. To prevent negative caregiving outcomes such as burden, interventions and caregiving support should both be focused on the individual caregiving situation and on the prevention of negative spill-over to other life domains.

Buffer effect, but no thrive-effect

Findings suggest that intrinsic motivations buffer decreases in positive caregiving experiences. Caregivers who provided long-term care experienced their caregiving as less positive, but only when they had low intrinsic caregiving motivations. Therefore, caregivers who provide long-term care with low intrinsic caregiving motivations may need more support and attention from policy makers and health care providers, in order to maintain positive caregiving experiences.

Although a buffer for decreases in positive caregiving experiences was found, a thrive-effect could not be demonstrated: caregivers did not have more positive caregiving experiences when they faced high stressors in good relationship quality or with high intrinsic caregiving motivations (i.e. growth in the face of adversity, (33)). In fact, for adult-child caregivers the effects of a disrupted schedule or health problems due to caregiving on self-rated burden were stronger when they provided care in a high quality relationship compared to a poor quality relationship. An explanation may be found in the distinction between 'caring for' (caregiving effect) and 'caring about' (family effect) (55, 56). Especially when relationship quality is high or intrinsic caregiving motivations are strong, informal caregivers are concerned about the health problems of their care recipient (family effect), and these concerns add up to the effect of the actual informal care provision (caregiving effect). However, more research on thrive-effects in informal caregiving is needed, as to our knowledge, our study is one of the first on this topic.

Limitations

Some limitations of this study need to be mentioned. First, this study is based on cross-sectional data. No conclusions can be drawn about the effects of changes over time in relationship quality and intrinsic caregiving motivations on caregiving outcomes, while such effects may be present, and short- and long-term effects may differ (57). Second, disrupted schedule due to caregiving was included as one of the secondary stressors, but with regard to the work situation only having paid work yes or no was included. Aspects such as workplace flexibility and recognition from colleagues and supervisor were not taken into account, while these aspects relate to the ability to combine informal care with paid work and the level of disruptions due to caregiving (58-60). Third, the subgroups of spousal caregivers (N=115) and

other caregivers (N=122) were too small for the intended multivariable linear regression analysis, and we had to confine the analysis in these subgroups to univariable linear regression analysis. As a result, associations with negative and positive caregiving experiences could not be compared between subgroups.

Final conclusions

To conclude, good relations between informal caregiver and care recipient and intrinsic caregiving motivations are important for having positive caregiving experiences. However, relationship quality and intrinsic caregiving motivations are probably least susceptible to external interventions, compared to caregiving stressors. This study showed that the negative spill-over effects of caregiving into other life domains such as work, social life, or health (secondary stressors) exist. Policy makers and important stakeholders should be aware of this effect, pay more attention to risk groups with high stressors, and develop suitable interventions in order to reduce the negative spill-over.

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Table S1: Multivariable linear regression analysis with outcome self-rated burden (0-100), subgroup of adult-child caregivers (N=423)

	Model 1			Model 2			Model 3		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI**
Constant	23.35*	(10.32)	(3.06 to 43.63)	4.80	(10.28)	(-15.40 to 25.00)	-30.53**	(9.75)	(-49.69 to -11.36)
Background/contextual variables [a]									
Caregiver age (24-88)	.09	(.17)	(-.25 to .42)	.03	(.16)	(-.29 to .35)	-.03	(.14)	(-.30 to .24)
Caregiver gender (female = 1)	-.01	(3.03)	(-5.97 to 5.95)	-1.29	(2.91)	(-7.01 to 4.43)	-.50	(2.51)	(-5.43 to 4.43)
Caregiver educational level (ref. primary)									
- secondary	.45	(3.22)	(-5.87 to 6.77)	1.36	(3.10)	(-4.75 to 7.46)	1.53	(2.66)	(-3.69 to 6.75)
- tertiary	.19	(3.38)	(-6.46 to 6.85)	1.42	(3.28)	(-5.03 to 7.86)	1.42	(2.83)	(-4.15 to 6.99)
Caregiver paid work (0, 1)	3.23	(3.09)	(-2.84 to 9.30)	5.13	(2.99)	(-.75 to 11.01)	3.45	(2.58)	(-1.62 to 8.53)
Informal support available (0, 1)	-1.31	(2.52)	(-6.26 to 3.63)	-.17	(2.43)	(-4.94 to 4.61)	.91	(2.08)	(-3.18 to 5.00)
Formal support available (0, 1)	7.06*	(2.75)	(1.66 to 12.45)	4.72	(2.64)	(-.47 to 9.91)	7.26**	(2.27)	(2.80 to 11.72)
Primary stressors									
Number of caregiving tasks (1-6)				5.30***	(1.12)	(3.10 to 7.49)	2.29*	(1.01)	(.30 to 4.28)
Total hours of caregiving a week (1-168)				.30**	(.11)	(.08 to .52)	-.02	(.10)	(-.22 to .18)
Duration of caregiving in years (0-46)				.06	(.21)	(-.35 to .47)	-.02	(.18)	(-.37 to .33)
Care recipient dementia (0, 1)				4.06	(2.59)	(-1.03 to 9.14)	2.50	(2.22)	(-1.87 to 6.87)
Care recipient behavioural problems (0, 1)				5.39	(4.98)	(-4.40 to 15.18)	1.14	(4.28)	(-7.27 to 9.55)
Secondary stressors									
CRA disrupted schedule (1-5) [b]							12.48***	(1.74)	(9.06 to 15.90)
CRA financial problems (1-5)							2.53	(1.81)	(-1.02 to 6.08)
CRA health problems (1-5) [b]							20.10***	(1.78)	(16.59 to 23.60)
Caregiving experiences									
Positive experiences (9-45)									
Moderators									
Relationship quality (0-100)									
Intrinsic caregiving motivation (0-2)									
Explained variance (R^2)	.021			.127			.367		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.

[b] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table S1 continued: Multivariable linear regression analysis with outcome self-rated burden (0-100), subgroup of adult-child caregivers (N=423)

	Model 4			Model 5		
	b	**(se)**	**(95% CI)**	**b**	**(se**	**(95% CI)**
Constant	-15.29	(11.87)	(-36.63 to 8.05)	-3.43	(12.78)	(-28.55 to 21.69)
Background/contextual variables [a]						
Caregiver age (24-88)	-.06	(.14)	(-.33 to .21)	-.08	(.14)	(-.36 to .19)
Caregiver gender (female = 1)	-.72	(2.50)	(-5.63 to 4.19)	-.88	(2.48)	(-5.76 to 4.00)
Caregiver educational level (ref. primary)						
- secondary	1.15	(2.65)	(-4.06 to 6.35)	.49	(1.64)	(-4.71 to 5.69)
- tertiary	.87	(2.83)	(-4.69 to 6.44)	.05	(2.84)	(-5.53 to 5.62)
Caregiver paid work (0, 1)	3.27	(2.57)	(-1.78 to 8.32)	3.53	(2.56)	(-1.50 to 8.56)
Informal support available (0, 1)	.78	(2.07)	(-3.29 to 4.85)	.90	(2.06)	(-3.15 to 4.94)
Formal support available (0, 1)	6.95**	(2.26)	(2.50 to 11.39)	6.66**	(2.26)	(2.22 to 11.10)
Primary stressors						
Number of caregiving tasks (1-6)	2.19*	(1.01)	(.21 to 4.17)	2.28*	(1.00)	(.31 to 4.26)
Total hours of caregiving a week (1-168)	-.01	(.10)	(-.21 to .18)	.02	(.10)	(-.18 to .22)
Duration of caregiving in years (0-46)	-.06	(.18)	(-.41 to .29)	-.03	(.18)	(-.38 to .32)
Care recipient dementia (0, 1)	2.52	(2.21)	(-1.84 to 6.87)	2.50	(2.20)	(-1.83 to 6.53)
Care recipient behavioural problems (0, 1)	1.09	(4.26)	(-7.27 to 9.46)	-1.53	(4.37)	(-10.13 to 7.06)
Secondary stressors						
CRA disrupted schedule (1-5) [b]	12.46***	(1.73)	(9.05 to 15.86)	11.99***	(1.73)	(8.60 to 15.38)
CRA financial problems (1-5)	2.24	(1.80)	(-1.31 to 5.78)	1.73	(1.80)	(-1.82 to 5.27)
CRA health problems (1-5) [b]	19.95***	(1.78)	(16.46 to 23.44)	19.23***	(1.80)	(15.69 to 22.76)
Caregiving experiences						
Positive experiences (9-45)	-.41*	(.19)	(-.77 to -.05)	-.26	(.19)	(-.64 to .12)
Moderators						
Relationship quality (0-100)				-.11	(.07)	(-.24 to .03)
Intrinsic caregiving motivation (0-2)				-2.96	(2.27)	(-7.41 to 1.50)
Explained variance (R^2)	.375			.386		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.

[b] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table S2: Multivariable linear regression analysis with outcome positive caregiving experiences (9-45), subgroup of adult-child caregivers (N=423)

	Model 1			Model 2			Model 3		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**	**b**	**(se**	**(95% CI)**
Constant	33.81***	(2.24)	(29.40 to 38.22)	34.97***	(2.35)	(30.35 to 39.58)	37.04***	(2.60)	(31.92 to 42.16)
Background/contextual variables [a]									
Caregiver age (24-88)	-.07*	(.04)	(-.15 to -.00)	-.07	(.04)	(-.14 to .00)	-.07	(.04)	(-.14 to .00)
Caregiver gender (female = 1)	-.54	(.66)	(-1.83 to .76)	-.47	(.66)	(-1.77 to .84)	-.54	(.67)	(-1.86 to .78)
Caregiver educational level (ref. primary)									
- secondary	-.76	(.70)	(-2.17 to .58)	-.90	(.71)	(-2.29 to .49)	-.92	(.71)	(-2.32 to .47)
- tertiary	1.10	(.74)	(-2.54 to .35)	-1.18	(.75)	(-2.65 to .29)	-1.33	(.76)	(-2.82 to .15)
Caregiver paid work (0, 1)	-.40	(.67)	(-1.72 to .92)	-.40	(.68)	(-1.74 to .95)	-.44	(.69)	(-1.80 to .91)
Informal support available (0, 1)	-.26	(.55)	(-1.34 to .81)	-.26	(.55)	(-1.35 to .83)	-.31	(.56)	(-1.41 to .78)
Formal support available (0, 1)	-.74	(.60)	(-1.91 to .43)	-.63	(.60)	(-1.82 to .55)	-.76	(.61)	(-1.95 to .43)
Primary stressors									
Number of caregiving tasks (1-6)				-.30	(.26)	(-.80 to .20)	-.23	(.27)	(-.76 to .30)
Total hours of caregiving a week (1-168)				.01	(.03)	(-.05 to .06)	.01	(.03)	(-.04 to .06)
Duration of caregiving in years (0-46)				-.10*	(.05)	(-.19 to -.01)	-.09	(.05)	(-.18 to .00)
Care recipient dementia (0, 1)				.06	(.59)	(-1.10 to 1.22)	.04	(.59)	(-1.13 to 1.20)
Care recipient behavioural problems (0, 1)				-.30	(1.14)	(-2.53 to 1.94)	-.12	(1.14)	(-2.36 to 2.13)
Secondary stressors									
CRA disrupted schedule (1-5) [b]							-.05	(.43)	(-.89 to .80)
CRA financial problems (1-5)							-.71	(.48)	(-1.66 to .24)
CRA health problems (1-5) [b]							-.37	(.48)	(-1.31 to .56)
Caregiving experiences									
Self-rated burden (0-100)									
Moderators									
Relationship quality (0-100)									
Intrinsic caregiving motivation (0-2)									
Explained variance (R^2)	.023			.038			.047		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.

[b] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table S2 continued: Multivariable linear regression analysis with outcome positive caregiving experiences (9-45), subgroup of adult-child caregivers (N=423)

	Model 4			Model 5		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI**
Constant	36.15***	(2.62)	(30.99 to 41.30)	26.65***	(3.02)	(20.73 to 32.58)
Background/contextual variables [a]						
Caregiver age (24-88)	-.07	(.04)	(-.14 to .00)	-.05	(.04)	(-.12 to .02)
Caregiver gender (female = 1)	-.55	(.67)	(-1.86 to .76)	-.41	(.64)	(-1.67 to .85)
Caregiver educational level (ref. primary)						
- secondary	-.88	(.71)	(-2.27 to .51)	-.44	(.68)	(-1.78 to .90)
- tertiary	-1.29	(.75)	(-2.77 to .19)	-.74	(.73)	(-2.17 to .70)
Caregiver paid work (0, 1)	-.34	(.69)	(-1.69 to 1.01)	-.50	(.66)	(-1.80 to .80)
Informal support available (0, 1)	-.29	(.55)	(-1.37 to .80)	-.33	(.53)	(-1.37 to .71)
Formal support available (0, 1)	-.55	(.61)	(-1.75 to .65)	-.39	(.59)	(-1.55 to .76)
Primary stressors						
Number of caregiving tasks (1-6)	-.16	(.27)	(-.70 to .37)	-.23	(.26)	(-.74 to .28)
Total hours of caregiving a week (1-168)	.01	(.03)	(-.04 to .06)	-.01	(.03)	(-.06 to .04)
Duration of caregiving in years (0-46)	-.09	(.05)	(-.19 to .00)	-.10*	(.05)	(-.19 to -.01)
Care recipient dementia (0, 1)	.11	(.59)	(-1.06 to 1.27)	.08	(.57)	(-1.04 to 1.20)
Care recipient behavioural problems (0, 1)	-.08	(1.14)	(-2.32 to 2.15)	1.37	(1.13)	(-.84 to 3.59)
Secondary stressors						
CRA disrupted schedule (1-5) [b]	.31	(.45)	(-.58 to 1.21)	.27	(.44)	(-.59 to 1.13)
CRA financial problems (1-5)	-.63	(.48)	(-1.58 to .31)	-.31	(.47)	(-1.22 to .61)
CRA health problems (1-5) [b]	.20	(.54)	(-.86 to 1.27)	.38	(.52)	(-.65 to 1.41)
Caregiving experiences						
Self-rated burden (0-100)	-.03*	(.01)	(-.06 to -.00)	-.02	(.01)	(-.04 to .01)
Moderators						
Relationship quality (0-100)				.06**	(.02)	(.02 to .09)
Intrinsic caregiving motivation (0-2)				1.85**	(.58)	(.71 to 2.99)
Explained variance (R^2)	.058			.137		

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.

[b] Results from separate linear regression models, because CRA disrupted schedule and CRA health problems were collinear.

Table S3: Moderation by relationship quality and intrinsic caregiving motivations, subgroup of adult-child caregivers (N=423) [a]

3A: Outcome = self-rated burden (0-100); stressor = number of caregiving tasks			
	b	**(se)**	**(95% CI)**
Constant	35.17***	(1.17)	(32.88 to 37.46)
Number of caregiving tasks (centred)	5.94***	(1.04)	(3.90 to 7.98)
Relationship quality (centred)	-.34***	(.07)	(-.47 to -.21)
Interaction	.05	(.06)	(-.06 to .16)
Constant	34.74***	(1.18)	(32.42 to 37.05)
Number of caregiving tasks (centred)	6.80***	(1.04)	(4.76 to 8.83)
Intrinsic caregiving motivations (centred)	-6.99**	(2.26)	(-11.43 to -2.55)
Interaction	-1.52	(2.02)	(-5.49 to 2.46)

3B: Outcome = self-rated burden (0-100); stressor = disrupted schedule			
	b	**(se)**	**(95% CI)**
Constant	36.91***	(1.10)	(34.74 to 39.07)
Disrupted schedule (centred)	14.34***	(1.44)	(11.51 to 17.17)
Relationship quality (centred)	-.27***	(.06)	(-.39 to -.15)
Interaction	.19*	(.08)	(.03 to .36)
Constant	36.21***	(1.09)	(34.06 to 38.35)
Disrupted schedule (centred)	15.82***	(1.43)	(13.02 to 18.62)
Intrinsic caregiving motivations (centred)	-6.92**	(2.09)	(-11.02 to -2.81)
Interaction	2.14	(2.63)	(-3.03 to 7.32)

3C: Outcome = self-rated burden (0-100); stressor = health problems			
	b	**(se)**	**(95% CI)**
Constant	36.62***	(1.05)	(34.55 to 38.70)
Health problems (centred)	20.79***	(1.65)	(17.55 to 24.04)
Relationship quality (centred)	-.20**	(.06)	(-.31 to -.09)
Interaction	.19*	(.09)	(.00 to .37)
Constant	35.98***	(1.03)	(33.95 to 38.01)
Health problems (centred)	22.06***	(1.62)	(18.88 to 25.24)
Intrinsic caregiving motivations (centred)	-5.14**	(1.97)	(-9.02 to -1.26)
Interaction	1.03	(3.13)	(-5.13 to 7.18)

3D: Outcome = positive caregiving experiences (9-45); stressor = duration of caregiving			
	b	**(se)**	**(95% CI**
Constant	27.82***	(.26)	(27.31 to 28.33)
Duration of caregiving in years (centred)	-.10*	(.05)	(-.19 to -.02)
Relationship quality (centred)	.09***	(.01)	(.06 to .11)
Interaction	.00	(.00)	(-.00 to .01)
Constant	27.90***	(.26)	(27.39 to 28.41)
Duration of caregiving in years (centred)	-.11*	(.05)	(-.20 to -.02)
Intrinsic caregiving motivations (centred)	3.01***	(.50)	(2.03 to 3.99)
Interaction	.14	(.10)	(-.05 to .33)

* p<.05; ** p<.01; *** p <.001

[a] Stressors and moderators are centred variables.

Figure S1: Moderation of association disrupted schedule and self-rated burden by relationship quality

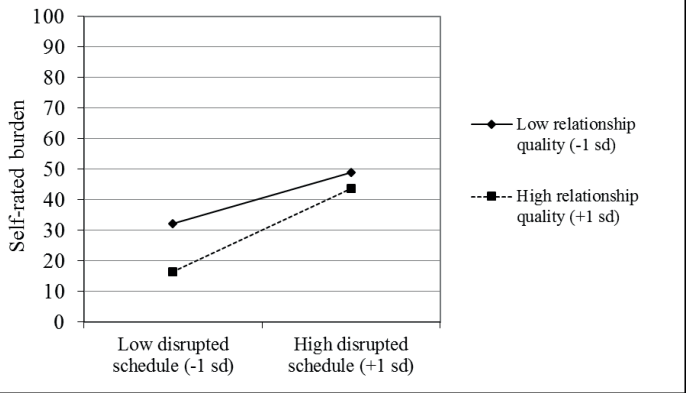

Figure S2: Moderation of association health problems and self-rated burden by relationship quality

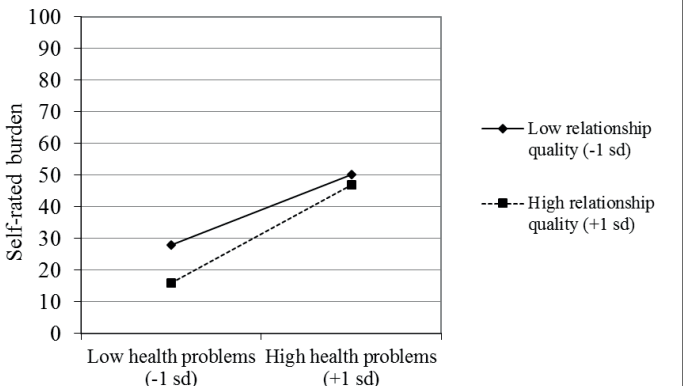

Table S4: Univariable linear regression analysis with outcome self-rated burden (0-100) (first column) and positive caregiving experiences (9-45) (second column), subgroup of spousal caregivers (N=115)

	Univariable results Outcome self-rated burden			Univariable results Outcome positive caregiving experiences		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**
Background/contextual variables [a]						
Caregiver age (24-88)	-.36	(.21)	(-.78 to .05)	-.01	(.04)	(-.09 to .07)
Caregiver gender (female = 1)	11.09*	(5.23)	(.73 to 21.45)	-2.53*	(1.02)	(-4.54 to -.51)
Caregiver educational level (ref. primary)						
- secondary	2.44	(6.46)	(-10.37 to 15.24)	.91	(1.27)	(-1.60 to 3.42)
- tertiary	-3.94	(6.54)	(-16.88 to 9.01)	.34	(1.28)	(-2.20 to 2.88)
Caregiver paid work (0, 1)	10.95	(5.22)	(.60 to 21.29)	-.39	(1.04)	(-2.45 to 1.68)
Informal support available (0, 1)	-2.26	(7.16)	(-16.44 to 11.93)	1.03	(1.40)	(-1.75 to 3.80)
Formal support available (0, 1)	-.93	(5.78)	(-12.39 to 10.52)	.05	(1.13)	(-2.19 to 2.30)
Primary stressors						
Number of caregiving tasks (1-6)	6.84***	(1.80)	(3.28 to 10.40)	-.31	(.37)	(-1.05 to .43)
Total hours of caregiving a week (1-168)	.31**	(.11)	(.10 to .52)	.00	(.02)	(-.04 to .05)
Duration of caregiving in years (0-46)	.72	(.36)	(.00 to 1.44)	-.06	(.07)	(-.20 to .09)
Care recipient dementia (0, 1)	13.32	(7.05)	(-.66 to 27.29)	-2.94*	(1.38)	(-5.67 to -.22)
Care recipient behavioural problems (0, 1)	24.55**	(8.08)	(8.54 to 40.55)	-2.20	(1.63)	(-5.44 to 1.03)
Secondary stressors						
CRA disrupted schedule (1-5)	22.00***	(2.55)	(16.95 to 27.05)	-.27	(.64)	(-1.54 to 1.01)
CRA financial problems (1-5)	11.55***	(2.80)	(6.00 to 17.10)	-.87	(.58)	(-2.02 to .29)
CRA health problems (1-5)	25.31***	(2.53)	(20.28 to 30.33)	-1.84**	(.66)	(-3.14 to -.53)
Caregiving experiences						
Positive experiences (9-45)	-1.63**	(.46)	(-2.53 to -.72)	-		
Self-rated burden (0-100)	-			-.06**	(.02)	(-.10 to -.03)
Moderators						
Relationship quality (0-100)	-.40***	(.11)	(-.62 to -.19)	.09***	(.02)	(.05 to .13)
Intrinsic caregiving motivation (0-2)	-10.02	(5.13)	(-20.17 to .14)	3.80***	(.96)	(1.90 to 5.69)

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.

Table S5: Univariable linear regression analysis with outcome self-rated burden (0-100) (first column) and positive caregiving experiences (9-45) (second column), subgroup of other caregivers (N=122)

	Univariable results Outcome self-rated burden			Univariable results Outcome positive caregiving experiences		
	b	**(se)**	**(95% CI)**	**b**	**(se)**	**(95% CI)**
Background/contextual variables [a]						
Caregiver age (24-88)	.18	(.21)	(-.23 to .59)	-.03	(.04)	(-.12 to .06)
Caregiver gender (female = 1)	10.34	(6.54)	(-23.28 to 2.60)	.49	(1.37)	(-2.23 to 3.22)
Caregiver educational level (ref. primary)						
- secondary	-1.83	(6.00)	(-13.70 to 10.04)	.04	(1.26)	(-2.44 to 2.53)
- tertiary	4.70	(6.37)	(-7.94 to 17.28)	.25	(1.33)	(-2.39 to 2.89)
Caregiver paid work (0, 1)	1.33	(5.12)	(-8.79 to 11.46)	-.77	(1.06)	(-2.87 to 1.34)
Informal support available (0, 1)	3.93	(4.88)	(-5.74 to 13.60)	.94	(1.02)	(-1.07 to 2.95)
Formal support available (0, 1)	-5.13	(5.10)	(-15.22 to 4.96)	-.30	(1.07)	(-2.41 to 1.81)
Primary stressors						
Number of caregiving tasks (1-6)	2.68	(2.13)	(-1.54 to 6.89)	.78	(.44)	(-.10 to 1.65)
Total hours of caregiving a week (1-168)	.27	(.36)	(-.45 to .99)	.19*	(.07)	(.05 to .34)
Duration of caregiving in years (0-46)	.38	(.31)	(-.24 to 1.00)	-.04	(.07)	(-.17 to .09)
Care recipient dementia (0, 1)	-.26	(5.89)	(-11.92 to 11.40)	.08	(1.23)	(-2.35 to 2.51)
Care recipient behavioural problems (0, 1)	16.58**	(5.96)	(4.77 to 28.38)	.25	(1.28)	(-2.28 to 2.79)
Secondary stressors						
CRA disrupted schedule (1-5)	19.26***	(2.82)	(13.67 to 24.85)	.22	(.69)	(-1.16 to 1.59)
CRA financial problems (1-5)	7.04	(3.61)	(-.11 to 14.18)	.34	(.76)	(-1.17 to 1.85)
CRA health problems (1-5)	24.72***	(3.26)	(18.27 to 31.17)	-1.05	(.82)	9-2.68 to .57)
Caregiving experiences						
Positive experiences (9-45)	-.91*	(.43)	(-1.77 to -.06)	-		
Self-rated burden (0-100)	-			-.04*	(.02)	(-.08 to -.00)
Moderators						
Relationship quality (0-100)	-.26*	(.13)	(-.51 to -.01)	.09***	(.03)	(.04 to .14)
Intrinsic caregiving motivation (0-2)	-4.38	(4.71)	(-13.72 to 4.95)	3.39***	(.94)	(1.53 to 5.24)

* p<.05; ** p<.01; *** p <.001

[a] Living together is excluded from the analyses, in line with the multivariable linear regression analysis in the total sample.